THIRD SPACE COMMONS

PROJECT REPORT

2023 US Solar Decathlon Build Challenge

THIRD QUADRANT DESIGN

THE UNIVERSITY OF BRITISH COLUMBIA

On behalf of our team and our university, we would like to acknowledge that Third Space Commons has been designed and built on the traditional, ancestral and unceded territories of the Musqueam people. Musqueam have cared for these lands since time immemorial, and this project has been made possible in part because of this.

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Project Summary

Third Space Commons aligns building design and construction with global efforts to combat the climate emergency. Built on the design principles of carbon minimalism, system minimalism, flexibility & adaptability, resilience, and living lab, Third Space Commons builds upon the prevailing knowledge of building sustainability and places carbon, not energy, at the forefront. The building speculates on housing for the 2023 US Solar Decathlon Build Challenge but will ultimately serve as an institutional integrated design 'third space' for experiential and research-based learning on zero emissions, regenerative, and climate resilient design.

Context

An evolution in our definition of sustainability in buildings is required, one that moves away from the standardized approaches common in industry, and places carbon at the forefront. The 2015 Paris agreement codified emissions reductions into law with the goal of limiting global warming to 1.5C, yet year after year emissions continue to increase. The world is facing an impending climate crisis that it has yet to confront. While this is a global crisis, the impacts are experienced locally, and an effective response must be contextualized **locally**. To understand our design philosophy, it is necessary to understand our local context, Vancouver.

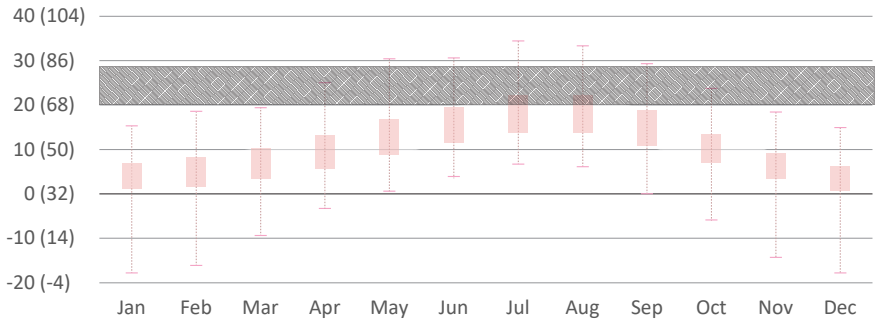

Figure 1- Average Temperature and Maximum [1]

Geography & Climate

The City of Vancouver is a coastal, seaport city bounded to the north by English Bay and the Burrard Inlet and to the south by the Fraser River.

Figure 2- Context Map

Vancouver has a moderate oceanic climate with warm dry summers contrasted by a rainy season between October and April. Vancouver receives, on average, 161 rainy days per year with 1189 mm – 2477 mm of precipitation per year and receives, on average, only 60 hours of sunshine in December and a total of 1938 hours of sunshine compared to 3107 hours in Denver, Colorado, and 3862 hours in Phoenix, Arizona.

As a result of climate change this seasonal variation is projected to intensify with increased precipitation in the fall and winter, and longer dry spells in the summer. This will likely result in increased extreme precipitation and wildfire events[2]. Along with the existing large magnitude earthquake risk.

1. Environment and, "Canadian Climate Normals 1981-2010 Station Data - Climate - Environment and Climate Change Canada," Weather.gc.ca, 2023, .

2. Metro Vancouver, "Metro Vancouver," Metrovancouver.org, 2019

Society & Economy

Bounded by mountains and water bodies, Vancouver has the highest population density in Canada with 5,750 people/square kilometer, and an expected population increase of over 250,000 in the next 30 years (Census of Population, 2021). This density and limited land area, along with other systemic issues, contributes to Vancouver being the third least affordable housing market in the world, and the least affordable in North America. For the average Vancouver citizen ownership of a 600 sqft condo is unobtainable let alone a single-family dwelling.

As the cost of ownership is a significant barrier for most residents, rental market participation is high, at 55%, with vacancy rates low, at 0.7%, and as a result rental affordability has suffered significantly. Vancouver is currently in the midst of a home affordability crisis with no clear end or solution in sight. Current housing market conditions continue to lead to increasing unaffordability.

Grid

In contrast to much of the United States, British Columbia boasts a 97% renewable power grid with the majority of BC's power coming from hydroelectric dams (BC Hydro).

Target Market

Our team strongly believes that the solution to the unique challenges faced in Vancouver does not lie in building energy-efficient single-family homes. Housing is a uniquely complex challenge in Vancouver without a clear solution in sight, and there is no housing solution that we can propose that would address this challenge.

Third Space Commons is located on the University of British Columbia's Vancouver campus, where it has been approved to remain until 2030 as an integrated design hub for experiential and research-based learning on zero emissions, regenerative, and climate resilient design, as pillars of actionable solutions to the climate emergency.

Throughout this two-year design-build process we have also considered how this building in its various typologies can be designed to adapt to different use cases and address different housing contexts. Those considerations are reflected in the design language of the building, its programming, and the market analysis.

Design Philosophy

Sustainability is a more local concept than it is often thought of; a sustainable building in Vancouver will have considerable differences to a sustainable building in Denver, for example. With consideration to Vancouver's geography, climate, society, economy, and grid, our building was designed upon the following design principles.

Third Spaces

Third Space Commons embodies the concept of 'Third Spaces' which are distinct from both the home and the workspace (first and second spaces). These spaces facilitate more informal, creative, and collaborative interactions in a comfortable setting, often referred to as a 'home away from home'. Our project sought to design a sustainability 'third space' on campus, to facilitate our goal of a space in which interdisciplinary groups of students could connect and collaborate on the future of zero emissions, regenerative, and climate-resilient design.

Carbon Minimalism

A project's total carbon footprint is the best measure of its impact on the climate. With thoughtful design, the carbon balance of a building in British Columbia is heavily weighted toward embodied carbon due to the near zero operational emissions of BC's electricity grid. Our low embodied carbon goal is achieved through material circularity, low-emission components, and on-site carbon sequestration.

Flexibility & Adaptability

A sustainable building must be adaptable to future use and programming, and considers use cases for the full duration of a building's life. From its reconfigurable room layouts to its evolving programming as both a residential live-work space to institutional student collaboration space, Third Space Commons can adapt to a wide array of occupant needs and desires.

Living Laboratory

Living labs are open innovation ecosystems. Third Space Commons has been designed for continuous interaction, monitoring, experimentation, and iteration, with the intent of advancing sustainable design among the next generation of engineers, architects, and construction professionals on campus and across industry.

System Minimalism (Passive Design)

Architectural and engineering elements were carefully chosen to facilitate natural ventilation, passive heating & cooling, and daylighting to minimize energy usage without sacrificing occupant comfort or embodied carbon.

Resilience

To best serve its occupants, a building must be able to respond to changing conditions. As climate change increases the probability of disruptions to normal operations, this building was designed to be resilient in all of its systems.

Our design-build, the Third Space Commons, attempts to answer the question of what sustainability truly looks like in Vancouver.

Construction Site Details

Third Space Commons is located at 6363 Biological Sciences Road in Vancouver, in the heart of the University of British Columbia. The building is nestled in the sustainability corridor of campus, next door to buildings such as the Centre for Interactive Research on Sustainability. With the building serving as a 'living lab' for student collaboration on solutions to the climate emergency after the competition, it was key to select a site location that would be close in proximity to the architecture, engineering, and business faculties on campus.

The University of British Columbia is the AHJ and Campus & Community Planning is the university staff that reviews and approves campus development applications for compliance with the UBC campus plan, BC building code, and the UBC technical guidelines (by-laws)

Construction Approach

Third Quadrant Design partnered with the University of British Columbia and local industry to develop Third Space Commons. Third Quadrant Design was the design and development team for the building, consisting of student architects and engineers. Our design process was integrated and interdisciplinary, and entirely student led.

Our industry design partners were the architects and engineers of record for Third Space Commons providing their professional review, seals, and letters of assurances to the building designed by Third Quadrant Design.

The Faculty of Applied Science at the University of British Columbia is the owner of the building and provided executive approvals required for campus development.

Project services at the University of British Columbia was responsible for management of the design and construction contracts required for Third Space Commons.

The construction site was managed by two students as project coordinators, with the addition of a project manager and superintendent from our construction partner, Ledcor. The student team leads of Third Quadrant Design also managed the coordination with various forces within UBC including permitting, buildings operations, IT, and security to bring the design off of the page. Invoices and budget management were handled by the construction and marketing students, in collaboration with our faculty advisor and finance staff within UBC Civil Engineering. Sponsorship and fundraising efforts were initially led by the whole student team until the formation of our existing outreach team. In conjunction with Applied Science's Development & Alumni Engagement, the marketing students and team leads engage new sponsors and maintain relationships with existing partners.

The Ledcor students and staff have been on site nearly every day since the start of construction in July, helping to manage the ever-changing affairs on site. The student coordinators engaged and managed subcontractors and suppliers, assisted with construction scheduling, led coordination meetings, drafted RFIs, reviewed submittals, and much more. Additionally, a student was brought on by our architect, Dialog. Along with design and drafting, she did site reviews, RFIs, site instructions, and submittals relating to architecture. Other students have been hired by RJC and Introba, our structural and electrical consultants, with some time allotted to working on Third Space Commons.

As construction ramped up at the end of 2022, we created a weekly schedule for student team members to volunteer on-site. This was especially important for our hempcrete installation throughout January and February, where students mixed and packed the material into our walls. Under the supervision of our Ledcor team, students have helped with numerous activities including installing sensors, refurbishing reused windows for the sunroom, sealing envelope penetrations, cleaning site, measuring for as-built documentation, installing cork underlay with heating mats, creating interior finishes, and more. Throughout the entire duration of design and construction, students have been at the core, working daily to bring Third Space Commons to life.

Industry Partners

Third Space Commons was a monumental undertaking by Third Quadrant Design, in collaboration with countless partners. Because of the generosity of UBC, particularly the Faculty of Applied Science, our consultants, and our contractors, this building was made possible.

Design Partners

Our team has partnered with a suite of consultants who have supported us throughout the project's development as mentors, designers of record, and in-kind project sponsors. They include:

- DIALOG- Architects-of-Record and Coordinating Professionals
- RJC Engineers- Structural Engineers-of-Record
- Introba- Mechanical and Electrical Engineers-of-Record
- Stantec- Civil Engineers-of-Record
- RDH- Building Science Support
- i3 - Geotechnical

These design partners bought into our vision for the next generation of sustainable design and helped us achieve our ambitions. Some of our project partners are shown above at our first official showing of the project site.

Construction Partners

Our primary construction partner is Ledcor Group, a multi-faceted construction company that offers specialized services in project and construction management, pre-construction services, design-build, general contracting, and Public Private Partnership (P3) delivery models for a variety of clientele. As long-standing members of both the Canadian and U.S. Green Building Councils, and one of the first companies in North America to participate in the Living Building Challenge, Ledcor continues to be a leader in green construction. Ledcor acted as our construction manager for Third Space Commons and provided a combination of time (i.e. construction management support), materials (ie. PPE, construction equipment), and labour to support the team. In addition to hiring two of the student team leads as project coordinators, they have brought on a project manager and site superintendent. Ledcor has helped us to manage a variety of sub-contractors for this project.

Our other largest construction partners include:

- Hall Constructors
- Houle Electric
- UCS

Countless trade contractors have donated or discounted their time in service of this project. Constructing a low-carbon building within the tight competition timeline was no small feat, and required monumental time and effort from all involved. Our team is endlessly grateful for the support of all who contributed to this endeavour.

Build Partners

Our build partners supported us through both in-kind and monetary donations which helped our dream become a reality. They include:

- Third Space
- Daniel Family Foundation
- BOSA properties
- Corix

Wall Raisers

- Lanefab
- Pitt Meadows Plumbing
- Urban One
- Intracorp
- Canuck Security
- BC Helical Piles Ltd.
- Oxygen 8
- i3
- Accoya

Cultivators

- Dick's Lumber
- Soprema
- VREC Solar
- Siga
- Columbia Skylights
- Fluor

Seed Sowers

- Geoscan
- West Coast Truss
- Terrafibre
- Graymont
- Fenstur
- PassiveHouse Canada
- Wescon Doors
- Hempworks Canada
- BGC
- Super Save Group
- Onni Group
- Armstrong
- Lionsgate Scaffolding Ltd.
- Sunbelt Rentals
- EllisDon
- Underhill
- Architectural Institute of British Columbia
- Griff Building Supply

Individual Sponsor

- Randy and Claudia Finlay

Institutional Sponsors

- UBC Faculty of Applied Science
- Santa Ono (former UBC president)
- UBC Sauder School of Business
- UBC Campus & Community Planning
- UBC Civil Engineering
- UBC Energy & Water Services
- UBC SALA

Future Plans for the House

After its first life for the competition, the building will have a second life as a living lab for experiential and research-based learning on zero emissions, regenerative, and climate-resilient design. UBC students will come together across faculties to collaborate on solutions to the climate emergency. The space's flexibility will allow for both formal and informal interactions in the form of a classroom and commons area. Integrated building systems such as rainwater collection, mixed-mode ventilation, and smart controls ensure that students have a 'living lab' to learn about, experiment, and test climate-resilient solutions.

Figure 4- render of seminar space in meeting configuration

Figure 3- render of seminar space in pin-up configuration

Summary of Online and Public Exhibition Success

Social Media

Instagram following increased 61% over the course of our 3 month sponsorship campaign to +700 followers.

Student Build Day Reel reach 465% greater than Instagram following

Accounts reached +360% in the last month alone.

LinkedIn page Views increased 40.2% over the course of our educational campaign and impressions Increased 138.2%

Past Events

Throughout our project, Third Quadrant Design made it a priority to actively engage the UBC community and industry professionals. Our team utilized events as one of our primary tools for education and engagement. Below are some our of most notable events over the past two years.

(1) TQD Project Unveiling Event (September, 2022) :

- First formal event we held for all our top tier sponsors so show our appreciation.
- Museum-tour, 5 guests, 50 attendees
- The event was a success and our sponsors were very impressed by the progress we made – some of them even increased their donation amount after the event!

(2) Student Build Days Series (October 2022 to March 2023):

- Hosted student build days where students from our subteams and the general student population could sign-up and come on site to help our construction team with relatively easy tasks.
- During the hempcrete installation period, we held 8 student build days that month which were promoted through our social media platforms and shared by UBC Applied Sciences' platforms.
- Over 50 Students showed up from all around campus coming to help with mixing and packing hempcrete for the walls.

(3)Recruitment Seminars (September 2021 and 2022) :

- Recruit new members and leads
- Hosted 2-3 every year with around 20-30 people join each session which are great turn outs and helps us receive.
- Our team grew to 70 students.

Community Engagement

Alongside these events, our team has also engaged the community through six presentations and workshop, four formal tours, and mentorship of three other student teams. We worked to inspire the community and future generations about what sustainable design looks like and how they can get involved.

Recognition

The team won one award- BC Embodied Carbon Award in the Small Building Category which the team is accepting this week. The team is currently working on various research papers including the first one to be accepted "Towards a truly zero carbon building: Design, construction and lifecycle analysis of Canada's first hempcrete institutional building", CISBAT conference 2023.

Community Exhibition Strategy

Upcoming Events

(4) Open House (April 4th-18th, 2023): To showcase our completed building and highlight our six key design principles, we are hosting an open house period from April 4th – April 18th.

- First two days dedicated to private tours for our close UBC internal sponsors.
- Signage inside the building explaining our six key design principles and how they are applied in the design and architecture of Third Space Commons.
- Showcasing our controls systems on an iPad and projecting it on our tv so attendees can follow along an immersive experience.

(5) Builders Appreciation BBQ (April 11th, 2023): As a gesture of gratitude for all the builders working in the unique conditions and tight timelines of our project, we are hosting a casual outdoor BBQ for all the trades people and management that have been working on our site for the past 7 months.

(6) Project Launch (April 18th, 2023): On the last day of our open house period, we are hosting a celebratory Launch Event for our top tier sponsors and UBC leadership – around 60 people.

- This will be an indoor/outdoor event held in and around our completed building beginning with a ribbon cutting ceremony.
- Reception style event with catered food and drinks, some sentimental speeches from our team captains, and networking and mingling.

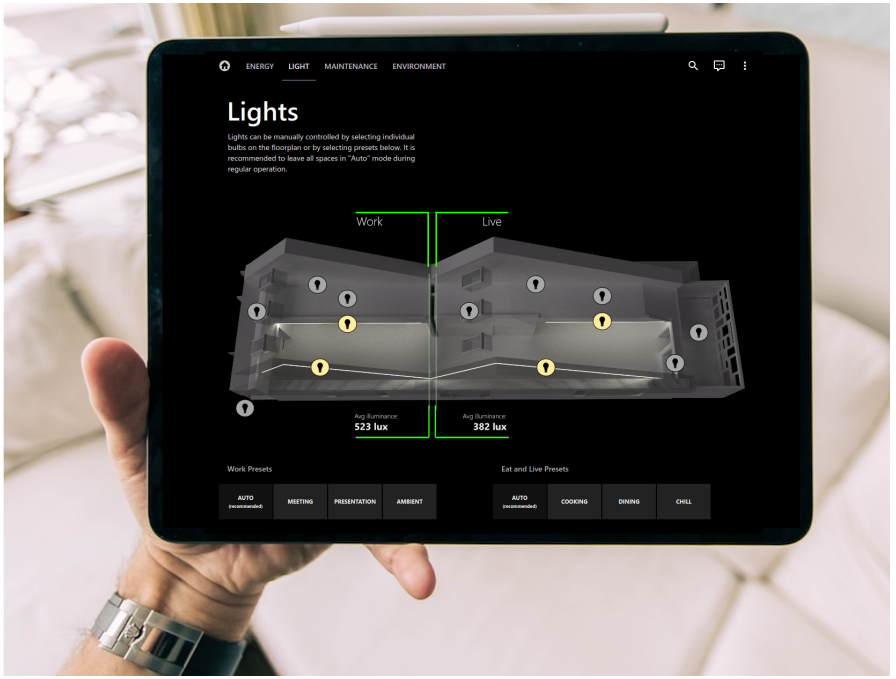

Figure 5- Interactive controls